

IN THE CLAIMS:

Please substitute the following listing of claims for the previous listing of claims.

1. (Currently amended) A substrate processing method comprising:
 - (a) providing a substrate in a process zone, the substrate comprising an etch resistant material over a mask material, the mask material being over an underlying material;
 - (b) providing an energized etching gas in the process zone to etch the mask material, the energized etching gas comprising a first composition;
 - (c) changing the first composition of the etching gas to a second composition to etch the mask material;
 - (b) (d) removing the etch resistant material in the process zone;and
 - (e) (e) after (d) (b), providing an energized process gas in the process zone to etch the underlying material.
2. (Currently amended) A method according to claim 1 wherein (d) (b) comprises providing an energized stripping gas in the process zone under process conditions selected to substantially remove a layer of etch resistant material.
3. (Original) A method according to claim 2 wherein the energized stripping gas comprises an oxygen-containing gas.
4. (Original) A method according to claim 3 wherein the energized stripping gas further comprises an oxygen activating gas.
5. (Original) A method according to claim 4 wherein the oxygen activating gas comprises a nitrogen-containing gas.

6-9. (Canceled)

10. (Currently amended) A method according to claim 1 ~~7~~ further comprising, ~~before (b), providing an energized process gas in the process zone to etch~~ etching apertures in the mask material.

11. (Previously presented) A method according to claim 1 wherein the underlying material comprises silicon and wherein the energized process gas comprises a halogen-containing gas.

12. (Currently amended) A method according to claim 11 wherein the energized process gas comprises one or more of CF₄, C₂F₆, NF₃, SF₆, Cl₂, Br₂, HBr HBR, and HCl.

13. (Original) A method according to claim 1 wherein the process zone is an energized gas zone in a process chamber.

14. (Currently amended) A substrate processing method comprising:
(a) providing a substrate in a process zone, the substrate comprising ~~a first and a second~~ an etch resistant material and a mask material;

(b) providing a first ~~an~~ energized ~~process~~ etching gas in the process zone to etch ~~form apertures in the first etch resistant~~ the mask material; and

(c) after (b), providing a second energized etching gas in the process zone to etch the mask material; and

[(c)] (d) removing the ~~second etch resistant material in the process zone.~~

15. (Canceled)

16. (Currently amended) A method according to claim 14 wherein the ~~second~~ etch resistant material comprises photoresist.

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17. (Currently amended) A method according to claim 14 wherein ~~(b)~~ comprises comprising forming apertures in the mask ~~first etch resistant~~ material in accordance with a pattern of the ~~second~~ etch resistant material.

18. (Currently amended) A method according to claim 14 wherein (d) ~~[(c)]~~ comprises providing an energized stripping gas in the process zone under process conditions selected to substantially remove the second etch resistant material.

19. (Original) A method according to claim 18 wherein the energized stripping gas comprises an oxygen-containing gas.

20. (Currently amended) A method according to claim 14 wherein the substrate comprises a layer under the ~~first and second~~ etch resistant and mask materials and further comprising providing an energized process gas to etch the layer.

21. (Currently amended) A method according to claim 14 wherein the substrate comprises a layer under the ~~first and second~~ etch resistant and mask materials and further comprising providing an energized process gas in the process zone to etch the layer.

22. (Currently amended) A method according to claim 14 wherein the substrate comprises a layer under the ~~first and second~~ etch resistant and mask materials and further comprising, after (d) ~~(e)~~, providing an energized process gas in the process zone to etch the layer.

23. (Original) A method according to claim 22 wherein the layer comprises silicon and wherein the energized process gas comprises a halogen-containing gas.

24. (Currently amended) A method according to claim 23 wherein the energized process gas comprises one or more of CF_4 , C_2F_6 , NF_3 , SF_6 , Cl_2 , Br_2 , HBr, HBR, and HCl.

25. (Original) A method according to claim 14 wherein the process zone is an energized gas zone in a process chamber.

26. (Withdrawn) A substrate processing method comprising:

- (a) providing a substrate in a process zone, the substrate comprising etch resistant material; and
- (b) removing the etch resistant material while detecting radiation emanating from the process zone.

27. (Withdrawn) A method according to claim 26 further comprising detecting a condition of the radiation related to removal of the etch resistant material.

28. (Withdrawn) A method according to claim 26 comprising detecting radiation emitted from an energized gas in the process zone.

29. (Withdrawn) A method according to claim 26 wherein the etch resistant material comprises photoresist and comprising removing the photoresist while detecting a condition of the radiation related to the removal of photoresist.

30. (Withdrawn) A method according to claim 26 comprising directing radiation onto the substrate and monitoring the radiation reflected by the substrate.

31. (Withdrawn) A method according to claim 26 comprising providing an energized stripping gas in the process zone under process conditions selected to substantially remove a layer of etch resistant material.

32. (Withdrawn) A method according to claim 31 further comprising changing process conditions when a characteristic feature of the radiation is detected.

33. (Withdrawn) A method according to claim 32 wherein the characteristic feature is related to an endpoint of removal of the etch resistant material.

34. (Currently amended) A substrate processing method comprising:

(a) providing a substrate in a process chamber, the substrate comprising an etch resistant material over a mask material;

(b) providing an a first energized process gas in the chamber to etch the mask material ~~process the substrate, the process gas comprising a polymer forming gas,~~ thereby depositing process residue on surfaces of the process chamber;

(c) providing an a second energized process gas in the chamber comprising a non-polymer forming gas to simultaneously ~~remove a~~ etch the mask material from the substrate and at least partially remove the process residue from the surfaces of the process chamber; and

(d) after (c), providing an a third energized process gas in the chamber to further process the substrate.

35. (Currently amended) A method according to claim 34 wherein (b) comprises providing an energized first process gas in the chamber to form apertures in a the mask material on the substrate.

36-37. (Canceled)

38. (Original) A method according to claim 34 wherein (d) comprises etching a material on the substrate.

39. (Withdrawn) A substrate processing method comprising:
- (a) providing a first substrate in a process chamber;
 - (b) providing an energized process gas to etch the first substrate, thereby depositing first residue on the surfaces of the process chamber;
 - (c) providing a second substrate in the process chamber; and
 - (d) providing an energized process gas to process the second substrate and simultaneously remove the first residue from the surfaces of the process chamber.
40. (Withdrawn) A method according to claim 39 wherein (d) comprises forming apertures in a material on the second substrate.
41. (Withdrawn) A method according to claim 40 wherein (d) comprises forming second residue on the surfaces of the process chamber.
42. (Withdrawn) A method according to claim 41 further comprising removing the second residue from the surfaces of the process chamber.
43. (Withdrawn) A method according to claim 41 further comprising removing a material from the second substrate and simultaneously removing the second residue from the surfaces of the process chamber.
44. (Withdrawn) A substrate processing method comprising:
- (a) providing a first substrate in a process chamber;
 - (b) providing an energized process gas to etch the first substrate, thereby depositing first residue on the surfaces of the process chamber;
 - (c) providing a second substrate in the process chamber; and
 - (d) providing an energized process gas to at least partially remove the first residue from the surfaces of the process chamber; and
 - (e) after (d), removing the second substrate from the chamber.

45. (Withdrawn) A method according to claim 44 wherein (d) comprises simultaneously processing the second substrate.

46. (Withdrawn) A method according to claim 44 wherein (d) comprises providing an energized process gas comprising a fluorine-containing gas.

47. (Withdrawn) A method according to claim 46 wherein (d) comprises providing an energized gas comprising one or more of CF_4 , C_2F_6 , SF_6 , and NF_3 .

48. (Withdrawn) A substrate processing method comprising:

- (a) providing a substrate in a process chamber;
- (b) providing a first energized process gas to etch a material on the substrate, thereby depositing residue on the surfaces of the process chamber;
- (c) providing a second energized process gas to remove substantially all of the residue deposited in (b) from the surfaces of the process chamber; and
- (d) after (c), removing the second substrate from the chamber.

49. (Withdrawn) A method according to claim 48 wherein (c) comprises simultaneously processing the substrate.

50. (Withdrawn) A method according to claim 48 wherein (c) comprises removing a second material from the substrate.

51. (Currently amended) A substrate processing method comprising:
- (a) providing a substrate in a process zone, the substrate comprising resist material over mask material;
 - (b) providing an energized first process gas in the process zone to form etch apertures in the mask material;
 - (c) after (b), providing an energized second process gas in the process zone to etch the apertures in the mask material;
 - [(c)] (d) providing an energized process gas in the process zone to remove the resist material; and
 - [(d)] (e) providing an energized process gas in the process zone to etch a layer under the mask material.
52. (Currently amended) A method according to claim 51 wherein (d) {e} comprises providing an energized stripping gas in the process zone under process conditions selected to substantially remove a layer of resist material.
53. (Original) A method according to claim 52 wherein the energized stripping gas comprises an oxygen-containing gas.
54. (Original) A method according to claim 51 wherein the layer comprises silicon and wherein the energized process gas comprises a halogen-containing gas.

55. (Currently amended) A substrate processing method comprising:

- (a) providing a substrate in a process zone, the substrate comprising a first etch resistant material, a second etch resistant material, an anti-reflective coating material that is between the first and second etch resistant materials, and a silicon-containing layer that is under the first and second etch resistant materials;
- (b) providing a first energized process gas in the process zone to form apertures in the first etch resistant material;
- (c) removing the second etch resistant material in the process zone; and
- (d) providing a second energized process gas in the process zone to simultaneously remove the anti-reflective coating material and etch the silicon-containing layer, the second energized process gas comprising one or more of CF_4 , C_2F_6 , NF_3 , SF_6 , Cl_2 , Br_2 , HBr, and HCl .

56. (Currently amended) A substrate processing method comprising:

- (a) providing a substrate in a process zone, the substrate comprising a resist material over a mask material, the mask material being over an underlying material;
- (b) forming apertures in the mask material by:
 - (i) in a first step, exposing the mask material to a first energized process gas in the process zone, the first energized process gas being substantially absent a polymer forming gas; and
 - (ii) in a second step, exposing the mask material to providing a first a second energized process gas in the process zone, the second energized process gas comprising polymer forming gas;
- (c) removing the resist material from the substrate by providing an energized stripping gas in the process zone; and
- (d) after (c), providing a second third energized process gas in the process zone to etch the underlying material.

57. (Canceled)

58. (Currently amended) A method according to claim ~~56~~ ~~57~~ wherein the first step comprises exposing the mask material to etchant gas comprising one or more of CF_4 , C_2F_6 , NF_3 , and SF_6 , and the second step comprises exposing the mask material to etchant gas comprising one or more of ClIF_3 , CH_2F_2 , and CH_3F .

59. (Previously presented) A method according to claim 56 wherein (b) comprises providing a first energized process gas comprising one or more of HCl , BCl_3 , HBr , Br_2 , Cl_2 , CCl_4 , SiCl_4 , SF_6 , F_2 , NF_3 , HF , CF_3 , CF_4 , CH_3F , CHF_3 , $\text{C}_2\text{H}_2\text{F}_2$, $\text{C}_2\text{H}_4\text{F}_6$, C_2F_6 , C_3F_8 , C_4F_8 , C_2HF_5 , C_4F_{10} , CF_2Cl_2 , and CFCl_3 .

60. (Previously presented) A method according to claim 56 wherein (c) comprises providing an energized stripping gas comprising one or more of O_2 , N_2 , H_2O , NH_3 , CF_4 , C_2F_6 , CHF_3 , $\text{C}_3\text{H}_2\text{F}_6$, $\text{C}_2\text{H}_4\text{F}_2$, and CH_3F .

61. (Previously presented) A method according to claim 56 wherein (c) comprises providing an energized oxygen-containing stripping gas in the process zone under process conditions selected to substantially remove the resist material.

62. (Currently amended) A method according to claim 56 wherein (d) comprises providing a ~~second~~ third energized process gas comprising one or more of CF_4 , C_2F_6 , NF_3 , SF_6 , Cl_2 , Br_2 , HBr ~~HBR~~ , and HCl .

63. (Previously presented) A method according to claim 56 wherein (a) comprises providing a substrate in the process zone, the substrate comprising a resist material over a mask material, the mask material being over a silicon-containing material.

64. (Currently amended) A method according to claim 56 wherein (a) comprises ~~comprises~~ providing a substrate in the process zone, the substrate comprising a resist material over a mask material, the mask material comprising one or more of silicon oxide, TEOS, and silicon nitride, and the mask material being over an underlying material.

65. (Currently amended) A substrate processing method comprising:

(a) providing a substrate in a process zone, the substrate comprising a photoresist material over a mask material, the mask material comprising one or more of silicon oxide, TEOS, and silicon nitride, and the mask material being over a silicon-containing underlying material;

(b) ~~forming apertures in the mask material by~~ providing an energized mask etching gas in the process zone to etch the mask material, the mask etching gas having a first composition comprising a non-polymer forming gas;

(c) changing the first composition of the mask etching gas to a second composition comprising a polymer forming gas to etch the mask material;

[(c)] (d) removing the photoresist material from the substrate by providing an energized stripping gas in the process zone; and

[(d)] (e) after (d) ~~(e)~~, providing an energized halogen-containing process gas in the process zone to etch the silicon-containing material.

66. (Currently amended) A method according to claim 65 wherein (c) ~~(b)~~ comprises providing ~~a first a second energized process gas composition~~ comprising one or more of HCl, BCl₃, HBr, Br₂, Cl₂, CCl₄, SiCl₄, SF₆, F₂, NF₃, HF, CF₃, CF₄, CH₃F, CHF₃, C₂H₂F₂, C₂H₄F₆, C₂F₆, C₃F₈, C₄F₈, C₂HF₅, C₄F₁₀, CF₂Cl₂, and CFCl₃.

67. (Currently amended) A method according to claim 65 wherein (d) ~~(e)~~ comprises providing an energized stripping gas in the process zone, the stripping gas comprising one or more of O₂, N₂, H₂O, NH₃, CF₄, C₂F₆, CHF₃, C₃H₂F₆, C₂H₄F₂, and CH₃F.

68. (Currently amended) A method according to claim 65 wherein (d) (e) comprises providing an energized oxygen-containing stripping gas in the process zone.

69. (Previously presented) A method according to claim 65 wherein (e) (d) comprises providing a second an energized halogen-containing process gas comprising one or more of CF₄, C₂F₆, NF₃, SF₆, Cl₂, Br₂, HBr HBR, and HCl.

70. (Currently amended) A substrate processing method comprising:

(a) providing a substrate in a process zone, the substrate comprising a resist material over a mask material, the mask material comprising one or more of silicon oxide, TEOS, and silicon nitride, and the mask material being over a silicon-containing material, and an anti-reflective coating material that is between the resist material and mask material;

(b) providing an energized first mask etching gas in the process zone to etch forming apertures in the mask material by providing an energized first mask etching gas in the process zone, the energized first mask etching gas comprising one or more of CF₄, C₂F₆, NF₃ and SF₆;

(c) after (b), providing an energized second mask etching gas in the process zone to etch the apertures, the energized second mask etching gas comprising one or more of CHF₃, CH₂F₂, and CH₃F the mask etching gas comprising one or more of HCl, BCl₃, HBr, Br₂, Cl₂, CCl₄, SiCl₄, SF₆, F₂, NF₃, HF, CF₃, CF₄, CH₃F, CHF₃, C₂H₂F₂, C₂H₄F₂, C₂F₆, C₃F₈, C₄F₈, C₂HF₅, C₄F₁₀, CF₂Cl₂, and CFCl₃;

(c) removing the resist material from the substrate by providing an energized stripping gas in the process zone, the stripping gas comprising one or more of O₂, N₂, H₂O, NH₃, CF₄, C₂F₆, CHF₃, C₃H₂F₆, C₂H₄F₂, and CH₃F; and

(d) after (c), providing an energized process gas in the process zone to simultaneously remove the anti-reflective coating material and etch the silicon-containing material, the process gas comprising one or more of CF₄, C₂F₆, NF₃, SF₆, Cl₂, Br₂, HBr HBR, and HCl.

71. (New) A substrate processing method comprising:
- (a) providing a substrate in a process zone, the substrate comprising a resist material over a mask material, the mask material being over an underlying material;
 - (b) forming apertures in the mask material by:
 - (i) in a first step, exposing the mask material to a first energized process gas in the process zone, the energized first process gas comprising one or more of CF_4 , C_2F_6 , NF_3 , and SF_6 ; and
 - (ii) in a second step, exposing the mask material to a second energized process gas in the process zone, and energized second process gas comprising one or more of CHF_3 , CH_2F_2 , and ClI_3F ;
 - (c) removing the resist material from the substrate by providing an energized stripping gas in the process zone; and
 - (d) after (c), providing a third energized process gas in the process zone to etch the underlying material.
72. (Now) A method according to claim 1 wherein the first composition comprises a non-polymer forming gas, the second composition comprises a polymer forming gas, and wherein (c) comprises changing to the second composition without stopping a flow of the non-polymer forming gas.
73. (New) A method according to claim 1 wherein the first composition is substantially absent polymer forming gas.
74. (New) A method according to claim 1 wherein the first composition comprises one or more of CF_4 , C_2F_6 , NF_3 , and SF_6 , and wherein the second composition comprises one or more of CHF_3 , CH_2F_2 , and CH_3F .

75. (New) A method according to claim 1 wherein the first composition consists essentially of CF_4 and argon, and wherein the second composition consists essentially of (i) CF_4 , (ii) one or more of CHF_3 , CH_2F_2 , and CH_3F , and (iii) argon.

76. (New) A method according to claim 14 wherein the first energized etching gas comprises a first composition comprising a non-polymer forming gas and the second energized etching gas comprises second composition comprising a polymer forming gas, and wherein (c) comprises changing the first composition to the second composition without stopping a flow of the non-polymer forming gas.

77. (New) A method according to claim 14 wherein the first energized etching gas comprises one or more of CF_4 , C_2F_6 , NF_3 , and SF_6 , and wherein the second energized etching gas comprises one or more of CHF_3 , CH_2F_2 , and CH_3F .

78. (New) A method according to claim 34 wherein the first energized process gas comprises one or more of CHF_3 , CH_2F_2 , and CH_3F , and wherein the second energized process gas comprises one or more of CF_4 , C_2F_6 , NF_3 , and SF_6 .

79. (New) A method according to claim 51 wherein the energized first process gas comprises a first composition comprising a non-polymer forming gas, and wherein the energized second process gas comprises a second composition comprising a polymer forming gas, and wherein (c) comprises changing the first composition to the second composition without stopping a flow of the non-polymer forming gas.

80. (New) A method according to claim 56 wherein the first energized process gas comprises a first composition comprising a non-polymer forming gas, and the second energized process gas comprises a second composition, and comprising changing the first composition to the second composition without stopping a flow of the non-polymer forming gas.

81. (New) A method according to claim 65 wherein (c) comprises changing the first composition to the second composition without stopping a flow of the non-polymer forming gas.

82. (New) A method according to claim 70 wherein the energized first mask etching gas comprises a first gas composition comprising a non-polymer forming gas, the energized second mask etching gas comprises a second gas composition, and wherein the first gas composition is changed to the second gas composition without stopping a flow of the non-polymer forming gas.